

# IFC SUSTAINABILITY WEBINAR

Preventing Bird Electrocution on Distribution  
Lines: From Risk to Good Practice

June 11, 2026



# Agenda

- Welcome and Objectives
- Opening remarks
- Why Bird Electrocution Happens:  
Risk Pathways and Species at Risk
- Understanding Electrocution Risk on  
Distribution Poles (Technical Basics)
- Designing Bird-Safe Distribution  
Lines (New Infrastructure)
- Retrofitting Existing Lines:  
What Works and Where
- Closing remarks



**M. Estella Nucci**

Biodiversity Specialist  
E&S Risk Dept  
World Bank Group



**Iván Ramírez**

Head of the Avian Species Unit  
UN Convention on Migratory Species



**Lori Anna Conzo**

Founder  
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**Janusz Sielicki**

International Association for Falconry  
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European Foundation for Falconry  
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**Alvaro Camina Cardenal**

Biodiversity Specialist  
Global Support Team  
World Bank Group



**Rick Harness**

Certified Wildlife Biologist  
EDM International, Inc.



**Umberto Gallo-Orsi**

Programme Management Officer  
Memorandum of Understanding  
on the Conservation of Migratory  
Birds of Prey in Africa and  
Eurasia (Raptors MOU)

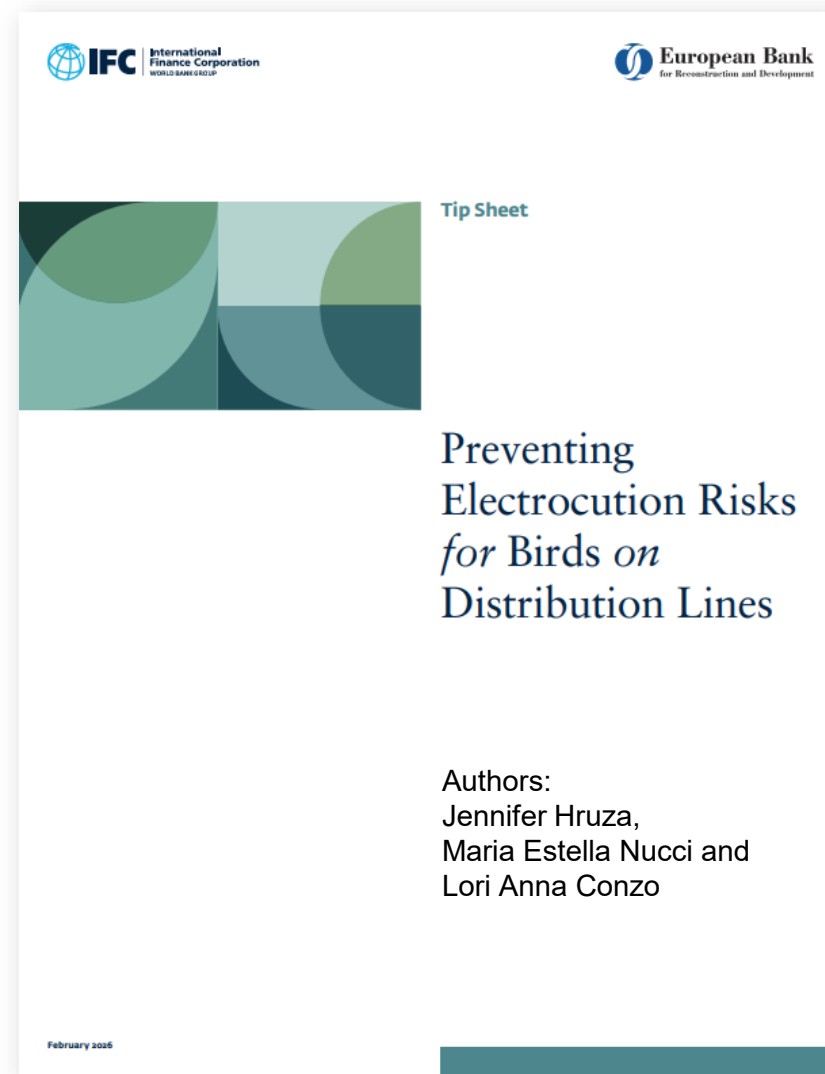


**Robert Adamczyk**

Senior ESG Adviser  
Head of Energy Team, Environment  
and Sustainability Department  
EBRD

# Objectives of this webinar

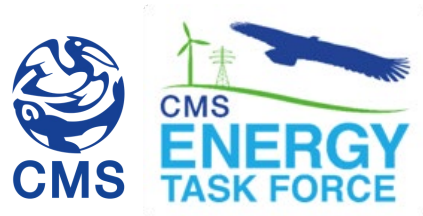
- **Introduce** IFC – EBRD’s Tipsheet on Preventing Bird Electrocutation on Distribution Lines
- **Raise awareness** of the risks and impacts of bird electrocutation associated with power infrastructure
- Highlight **why this issue matters** for biodiversity conservation and project risk management
- Provide a high-level **overview** of good-practice **prevention and mitigation measures**
- Encourage **early consideration** of bird-safe design and management approaches in projects



# Preventing Electrocution Risks for Birds on Distribution Lines

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UN CMS Energy Task Force



Iván Ramírez, Head of the Avian Species Unit  
UN Convention on Migratory Species



Official Use Only

# UN CMS Energy Task Force

## Convention on Migratory Species



**The UN treaty on migratory species**  
est. 1979, administered by UNEP



**Multistakeholder Energy Task Force**  
The only UN task force on energy-nature nexus  
Established by the CMS COP



CMS

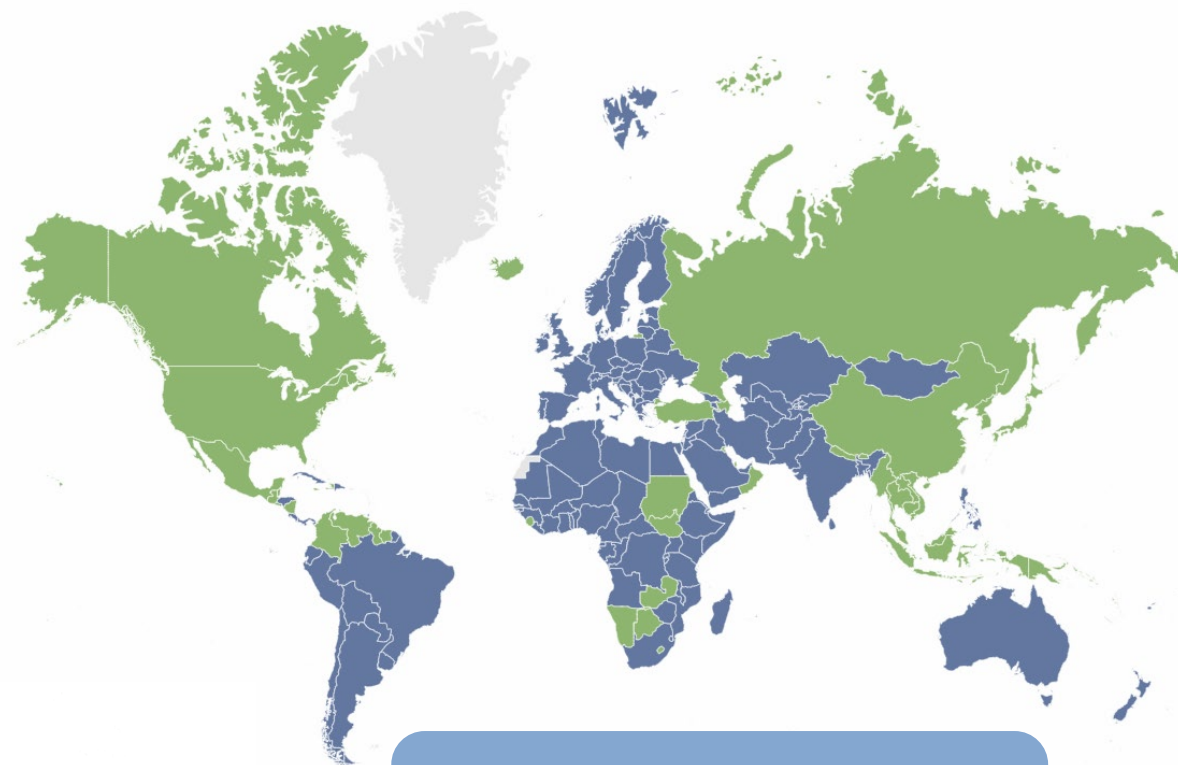


**CONVENTION ON  
MIGRATORY  
SPECIES**

UNEP/CMS/Resolution 11.27 (Rev.COP15)  
Original: English

### RENEWABLE ENERGY AND MIGRATORY SPECIES

Adopted by the Conference of the Parties at its 15<sup>th</sup> Meeting (Campo Grande, March 2026)

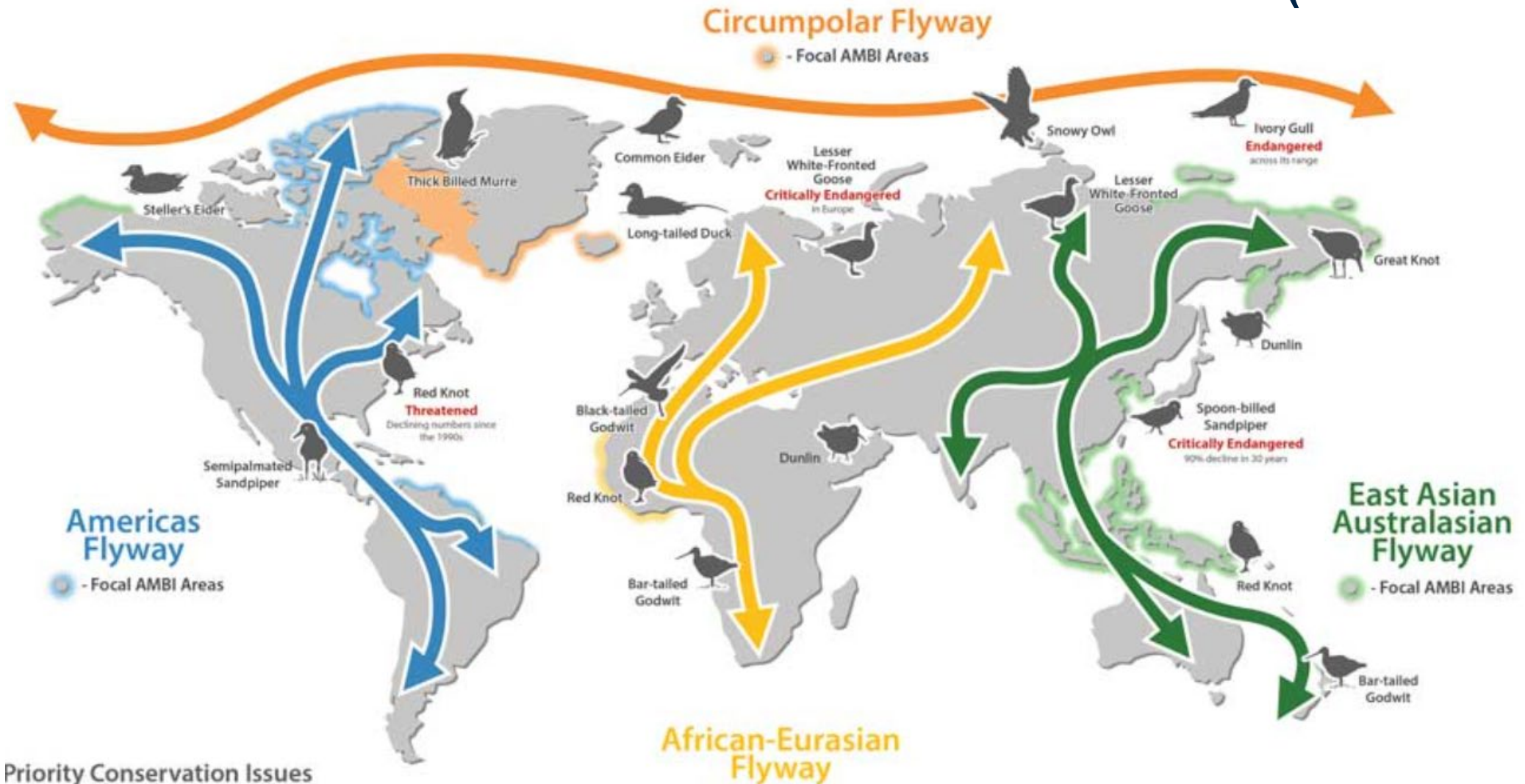


Find out more:  
[www.cms.int/en/taskforce/energy-task-force](http://www.cms.int/en/taskforce/energy-task-force)



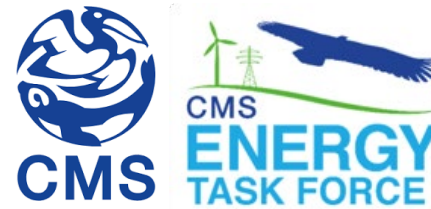
# Flyways guide our work

Resolution 12.11  
(Rev.COP15)



# Priorities & Influence

## Reconciling energy transition with nature



### Multistakeholder & intergovernmental cooperation

Foster collaboration across 20+ governments, IFIs, IGOs, and NGOs  
Elevating engagement with underrepresented regions, academia and the private sector



### Empower actions

Projects, tools, advise on challenges  
Fundraising updates: grants secured & pipeline, inc. Small Grant Fund



### Foster synergies across multilateral processes

Transforming CMS's engagement and influence in other MEAs



### A knowledge hub

Produce & promote guidance and best practices  
Communications: mailing list, newsletters, and social media



# Some guidance produced

January 2025

ENERGY NATURE | Workshop Summary Report

## Key Actions & Takeaways from 'Connecting Biodiversity 2.0'

16 October 2024 | Brussels

Renewables Grid Initiative | SafeLines | Birds

ENERGY NATURE | IVM Best Practice Guide

### Protecting native species while creating social benefits

from REN

Download the Guide

ENERGY NATURE

### AVIAN-POWER LINE COLLISION:

Overview Of Risk Factors And Effectiveness Of Mitigation Measures

Renewables Grid Initiative

CMS ENERGY TASK FORCE

Welcome to the July 2025 issue of the CMS Energy Task Force Newsletter

This newsletter aims to update the ETF members and observer network on relevant news, advances in tools and guidance for the renewable energy sector, and upcoming events, and to welcome new members and observers.

In this edition of the newsletter, we will be diving into:

- CMS COP 14 Updates
- ETF Updates
- Recent activities of the ETF network
- Key dates for the year ahead

We would also like to extend a warm welcome our newly joined member Australian Government Department of Climate Change, Energy, the Environment and Water, represented by Mark Carey, Kerri Woodcock and Nareli Montgomery!

CMS ENERGY TASK FORCE

CMS ETF JULY 2025

## ETF NEWSLETTER

Welcome to the July 2025 issue of the Convention on Migratory Species (CMS) Energy Task Force (ETF) Newsletter

This newsletter aims to update the ETF members, observers and stakeholders on relevant news, events, tools and guidance on nature-compatible energy transitions, as well as to introduce new members and observers.

- In the edition of the newsletter, we will be diving into:
- CMS updates
  - Publications
  - ETF Small Grant Fund updates
  - Events and webinars
  - Key dates for the year ahead

RGI-MOROCCO EVENT

## PROTECTION DES OISEAUX LE LONG DU RÉSEAU ÉLECTRIQUE

## POUR LA PROTECTION DE LA NATURE ET LA SÉCURITÉ DU SYSTÈME ÉLECTRIQUE

nature action dialogues 2025

Hosted by: proteus | UN | WCMC



UN environment programme | CMS ENERGY TASK FORCE

## Nature Positive Energy Transition

— Driving Synergies from Policy to Implementation

Multistakeholder Dialogue during UNFCCC SB62

Thursday 19th June 2025, 13:30-15:00 CEST

UN Campus, Bonn, Germany

By Invitation Only. For expression of interest, contact <a href="mailto:cathy.li@birdlife.org">cathy.li@birdlife.org</a>

The CMS Energy Task Force is supported by: CMS, BirdLife International, UN Environment Programme, OEB, Australian Government Department of Climate Change, Energy, the Environment and Water

BirdLife International

## RENEWABLE ENERGY THAT RENEWS NATURE:

BirdLife Europe's recommendations on how to align the EU's renewable energy expansion with biodiversity goals

MAY 2025

IUCN | THE BIODIVERSITY CONSULTANCY

## Spatial planning for wind and solar developments and associated infrastructure

Leon Bennun, Claire Fletcher, Aonghus Cook, David Wilson, Ben Jobson, Rachel Assante-Owusu, Anika Dakin, Quinn Liu

INTERNATIONAL UNION FOR CONSERVATION OF NATURE

BirdLife International | Fauna & Flora International | The Nature Conservancy | WCS

IUCN | THE BIODIVERSITY CONSULTANCY

## Opportunities for enhancing biodiversity at wind and solar energy developments

Ben Jobson, Aonghus Cook, Claire Fletcher, Leon Bennun, Lucy Murrell, Rachel Assante-Owusu, Quinn Liu

INTERNATIONAL UNION FOR CONSERVATION OF NATURE

BirdLife International | Fauna & Flora International | The Nature Conservancy | WCS

IUCN | THE BIODIVERSITY CONSULTANCY

## Biodiversity and responsible sourcing for wind and solar developments

An overview and action agenda

Claire Fletcher, Leon Bennun, Ben Jobson, Laura Sontje, Lucy Murrell, Rachel Assante-Owusu, Quinn Liu

INTERNATIONAL UNION FOR CONSERVATION OF NATURE

BirdLife International | Fauna & Flora International | The Nature Conservancy | WCS



# Preventing Electrocution Risks for Birds on Distribution Lines

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Why Bird Electrocution Happens:  
Risk Pathways and Species at Risk



**Lori Anna Conzo**, Founder  
The Nature Collective

[lconzo@thenaturcollective.net](mailto:lconzo@thenaturcollective.net)

# Why Bird Electrocution Matters

*Bird electrocution on distribution networks is a **global conservation challenge***

- **Distribution networks are ubiquitous:** ~8 million km of medium-voltage distribution lines globally and ~72 million km of low-voltage distribution lines
- **More than 80 million km** of new or refurbished grids **expected by 2040**
- Powerline electrocution and collision **kill millions of birds annually** (Bernardino et al. 2018; Jenkins, Smallie, and Diamond 2010; Martín Martín et al. 2019)
- Electrocution is one of the leading causes of mortality for large bird species

***And other wildlife too!***



Source: All images are AI generated

# Why Bird Electrocution Matters



**Golden Eagle, *Aquila chrysaetos***

Ranges from North America, Europe, Asia, and North Africa

Photo credit: Rick Harness



**Spanish Imperial Eagle, *Aquila adalberti*,**

Ranges in the Iberian Peninsula

Photo credit: Alvaro Camiña Cardenal



**Saker Falcon, *Falco cherrug***

Ranges from Central Europe, Central Asia, and East Asia

Photo credit: International Association for Falconry and Birds of Prey



**White Stork, *Ciconia ciconia***

Ranges from Europe, the Middle East, and Africa

Photo credit: Alvaro Camiña Cardenal



**Egyptian Vulture, *Neophron percnopterus***

Ranges from Southern Europe, Africa, the Middle East, and South Asia

Photo credit: Rick Harness

Source:  
Map image is  
AI generated

# Why Bird Electrocution Matters



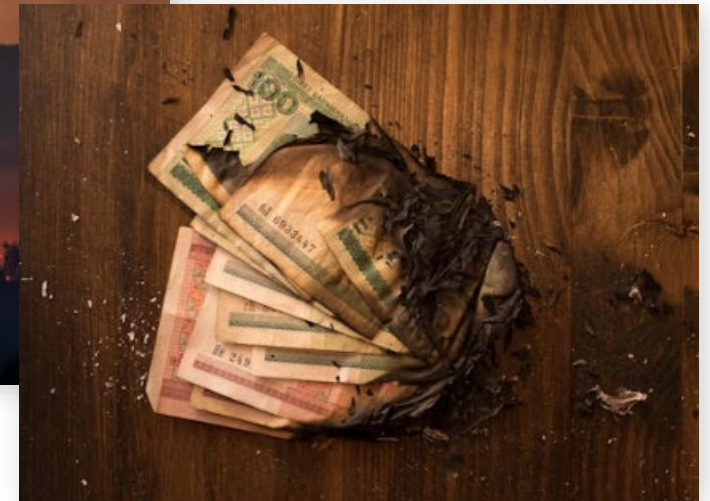
Power Outages



Equipment Damage



Wildfires



Financial Losses

Photo credits (free images):

Equipment damage & Power outage

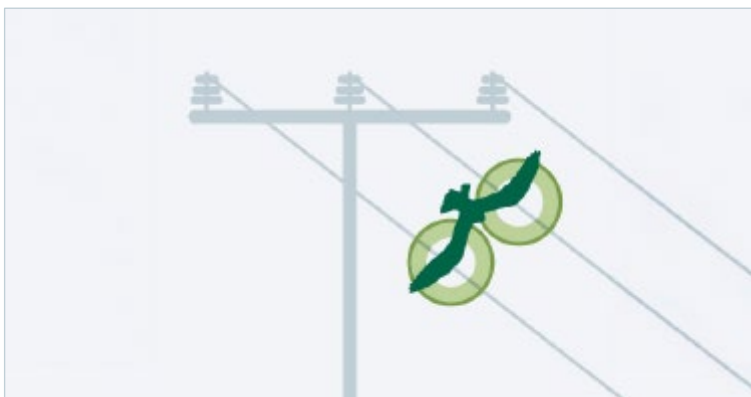
<https://www.pexels.com/search/power%20outage/>

Wildfire: <https://unsplash.com/s/photos/wildfire>

Financial losses:

<https://www.pexels.com/search/financial%20losses/>

# How Electrocution Happens



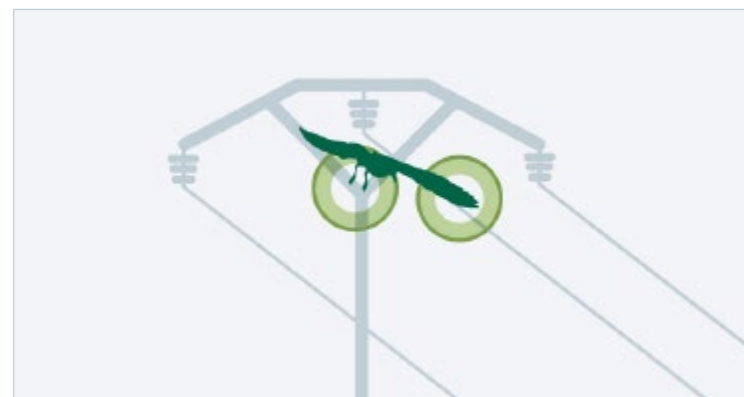
## Energized–Energized Contact

Bird simultaneously touches:

- Two energized conductors
- Two different electrical phases

**Result: Current flows through the bird**

- Most events occur on **medium-voltage distribution poles**
- Risk increases where components are closely spaced
- Body, wings, feet, or bill can complete the circuit



## Energized–Grounded Contact

Bird simultaneously touches:

- An energized conductor
- A grounded component:
  - Pole
  - Crossarm
  - Transformer structure

**Result: Current flows through the bird**

Source: Content in figures has been provided by Martin Martin et al, 2019 and were modified for illustration purposes only in the Preventing Electrocution Risk for Birds on Distribution Lines Tip Sheet

# Which birds are most at risk

- **Medium- and large-bodied birds** (raptors, vultures, waterbirds, and corvids)
- Species that regularly **perch on power poles**
- Birds that use power poles for **roosting or nesting** on electrical structures increases the likelihood of contact with energized components
- Birds that use poles as **lookout points**



Photo credit: Alvaro Camiña Cardenal



Photo credit: Rick Harness



Photo credit: Rick Harness

# High-Risk Landscapes



**Forested landscapes are lower risks for birds – other species however could be at risk**

Source: All images are AI generated

# Mitigation Hierarchy

- **Conduct biodiversity screening**
  - is the (distribution lines) project located in a desert, steppe, wetland, grassland or agricultural area?
  - are there large-bodied birds associated with the area, especially threatened birds?
- **Spatial avoidance**
  - Micro-siting to avoid localized areas of high risk (e.g., wetlands)
  - Undergrounding is the safest option, where financially and technically feasible
- **Avoidance by design**
  - Bird-safe designs
- **Minimization**
  - Use of insulation
  - Retrofitting existing aerial lines

# Understanding Electrocution Risk on Distribution Poles



**Janusz Sielicki**  
International Association for Falconry and Conservation of Birds of Prey  
European Foundation for Falconry and Conservation

[janusz.sielicki@gmail.com](mailto:janusz.sielicki@gmail.com)

# Understanding Electrocution Risk on Distribution Poles (Technical Basics)

## Why falconers care

### Key terminology and components

- Poles, crossarms, conductors, insulators, jumper wires, equipment poles

### Role of:

- Insulator position
- Crossarm material (conductive vs non-conductive)
- How pole geometry influences risk



# Pivotal Moments for the Long-term Protection of Birds

When the construction and materials of distribution lines are crucial?

- Thousands of kilometers of new lines are being built and planned.
- Thousands of kilometers of existing lines are planned to be modernized

These are the moments when **proper design and proper materials** are crucial.

E.g. in Mongolia many distribution lines were modernized – thousands of old wooden poles were replaced by modern concrete ones.

And they became a 24/7 killing machines.





Photos  
Andrew Dixon

# Key terminology – conductors, conducting materials

- 1. Prime Metallic Conductors (The Most Dangerous/Efficient)** – These metals offer the least resistance to electrical current, making them the primary materials used in electrical grids and electronics.
  - **Silver**
  - **Copper**
  - **Aluminum**
  - **Gold**
- 2. Structural and Everyday Metals** – These metals still conduct electricity incredibly well and are common sources of accidental electrocution.
  - **Steel and Iron, reinforced concrete**
  - **Brass and Bronze**
  - **Lead and Tin**
- 3. Biological and Environmental Conductors** – These are non-metal conductors.
  - **Tap Water, Rainwater, and Seawater**
  - **Graphite (Carbon)**
  - **The Human and Animal Body:**
    - **The Earth (Soil/Ground)**



# Key terminology – animal (and human) body

1. Animals (including us, humans) are essentially live bags of saltwater.
2. The body is roughly 60% water filled with dissolved electrolytes (sodium, potassium, calcium),
3. Animals are excellent conductors of electricity.
4. Feathers and fur are made of creatine
5. 100% dry feathers are insulators, but .....
6. In the real-life feathers are always covered by some dust, oils, water, etc.
7. High-Voltage Breakdown: Every insulator has a limit called its dielectric breakdown voltage. If the voltage is high enough (like a lightning strike or utility power lines), the electrical pressure will violently punch right through the feather, turning the air and the feather into a conductor.

# Key terminology – insulating materials

- 1. High-Performance Safety Insulators (PPE & Tools)** – These materials are flexible, durable, and specifically engineered to protect workers handling live electricity.
  - **Electrical-Grade Rubber** (Elastomers)
  - **Fiberglass** (Glass-Reinforced Plastic)
- 2. Common Wiring & Equipment Insulators** – These materials are found in everyday electronics, appliances, and household wiring to keep current contained within the circuit.
  - **Plastic** (PVC, Polyethylene, Nylon): Polyvinyl Chloride (PVC)
  - **Teflon** (PTFE)
  - **Mica**
- 3. Industrial & High-Voltage Insulators** – Used by utility companies to isolate high-voltage power lines from grid towers and poles.
  - **Porcelain and Ceramics**
  - **Glass**
- 4. Natural / Conditional Insulators (Use with Caution)** – These materials can act as insulators under the right conditions, but they are highly unpredictable and should not be relied upon for guaranteed safety.
  - **Dry Wood**
  - **Air**
  - **Pure Water** – Deionized or perfectly pure water – does not occur in nature

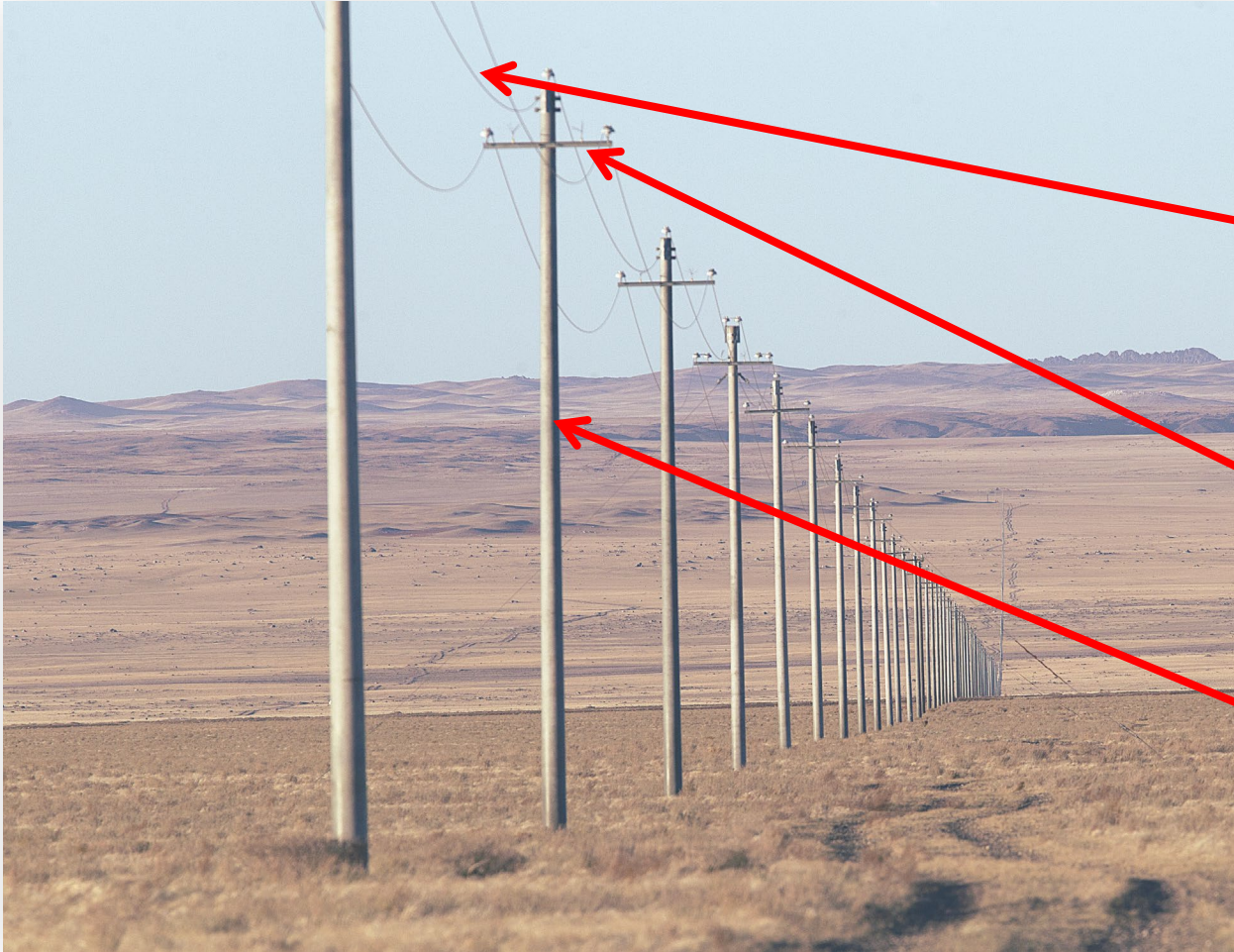


Every insulating material has a breakdown voltage (dielectric limit).



The danger of a conductor depends heavily on its environment.

# Key terminology – poles, crossarms, wires



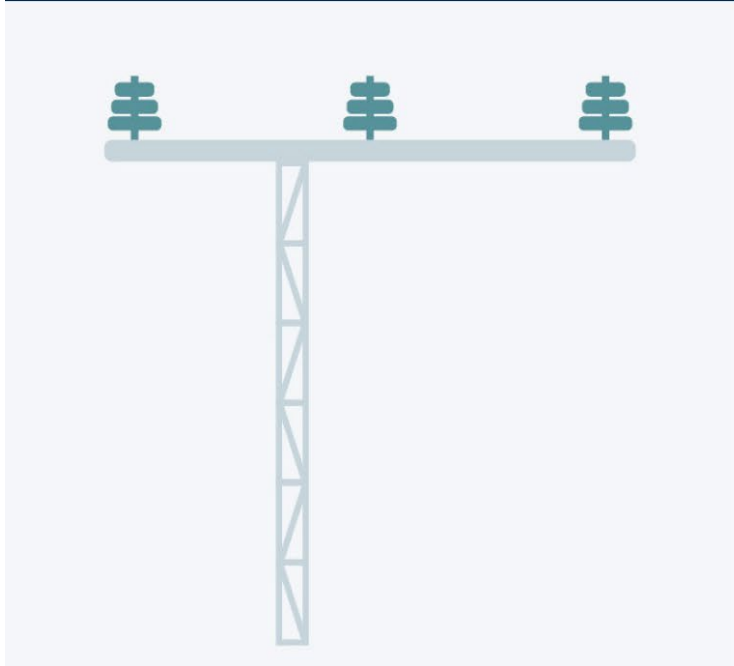
**The wires** are made of metal, might be covered with insulation (rubber or special plastic)

**Crossarm** – metal in most cases  
Possible fiberglass

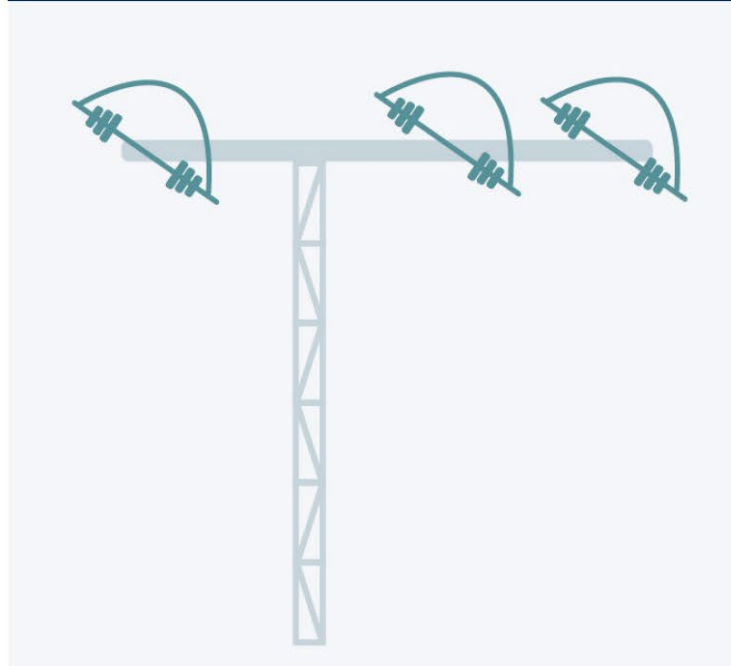
**Pole** – metal or reinforced concrete or wood

# Types of insulators

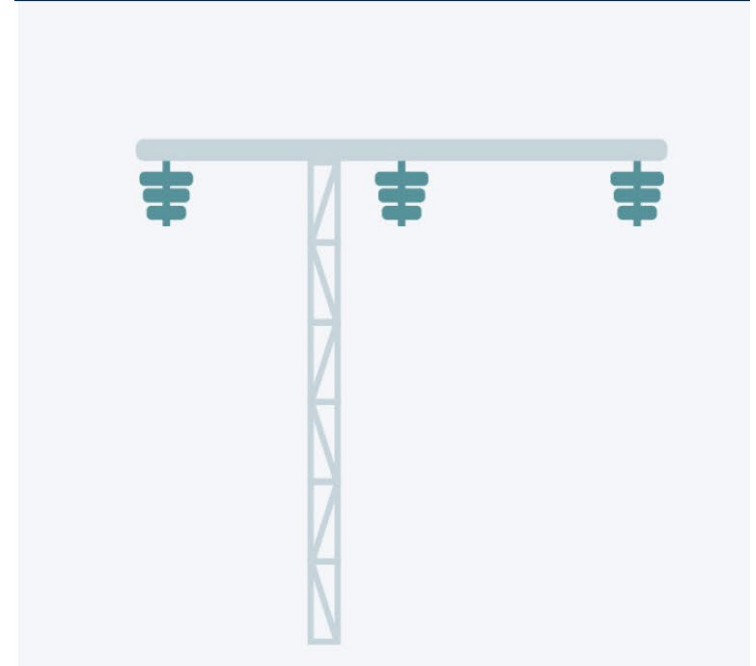
*Figure H. Pin insulators*



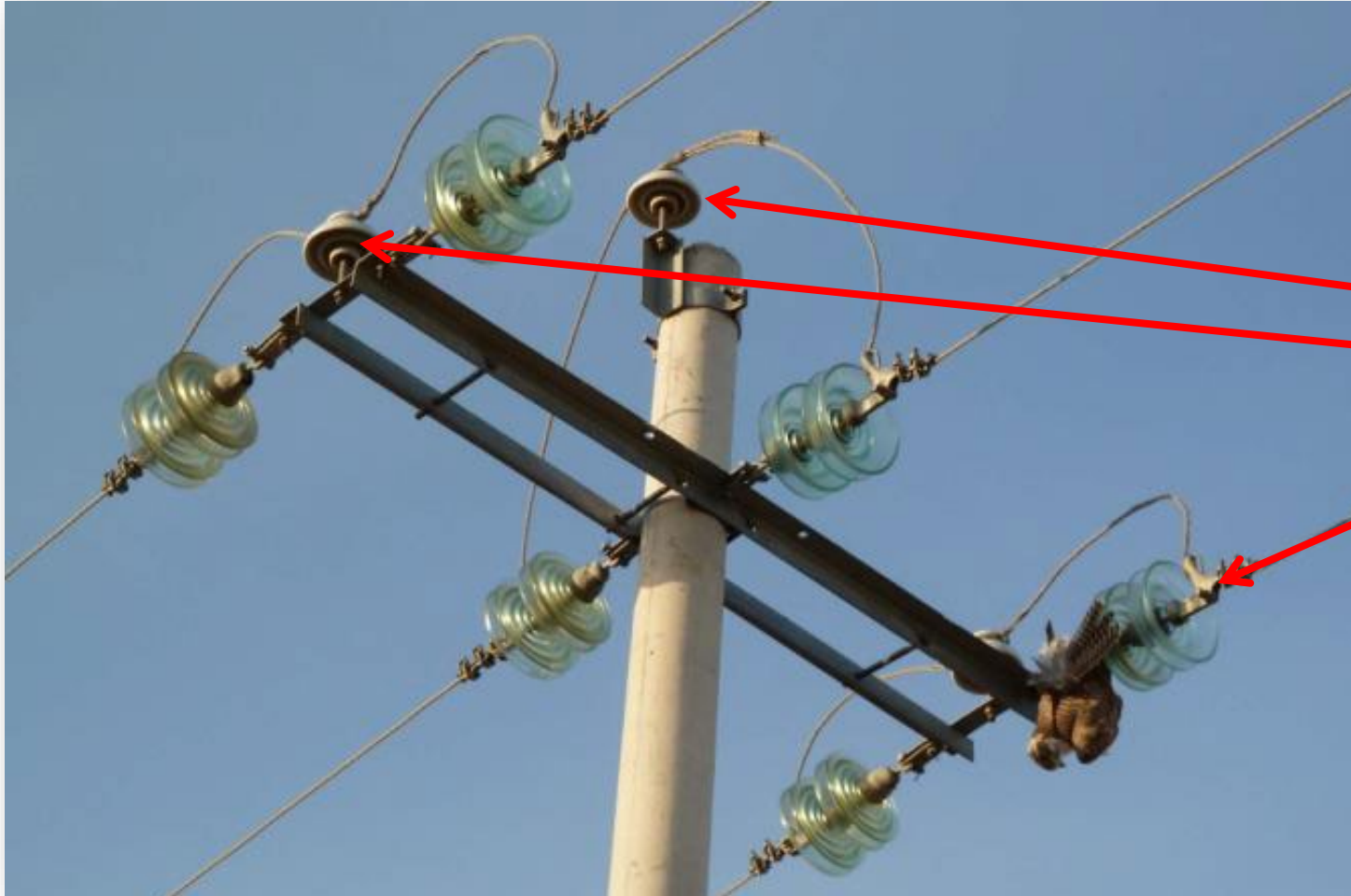
*Figure I. Strain insulators*



*Figure J. Suspended insulators*

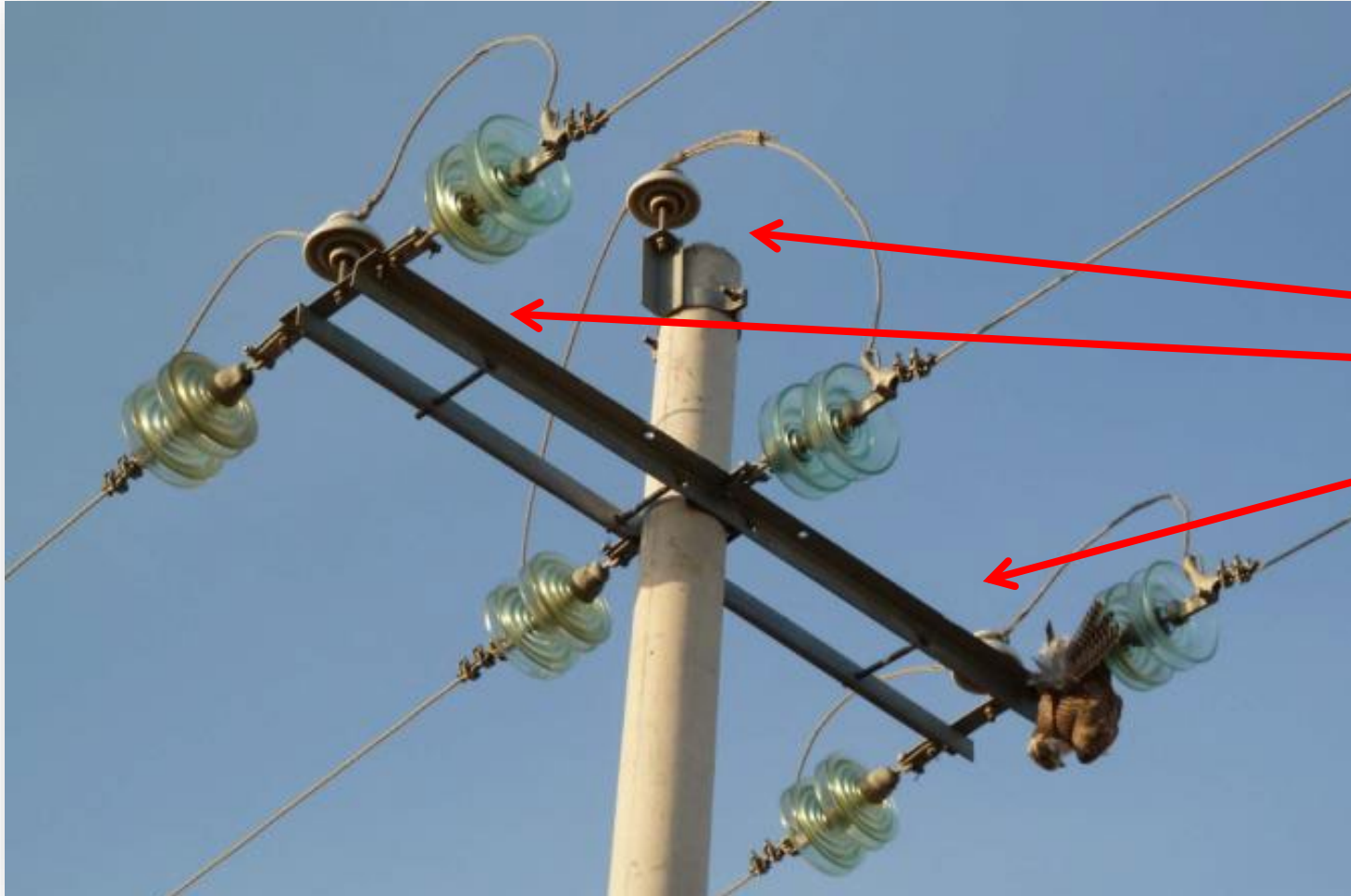


# Key terminology – insulators



**Insulators** are necessary for the wires to cross the pole without earthing (usually made of ceramic or glass)

# Key terminology – potential perching



Places where  
birds can perch

# Crossarm – metal vs. fiberglass



Metal



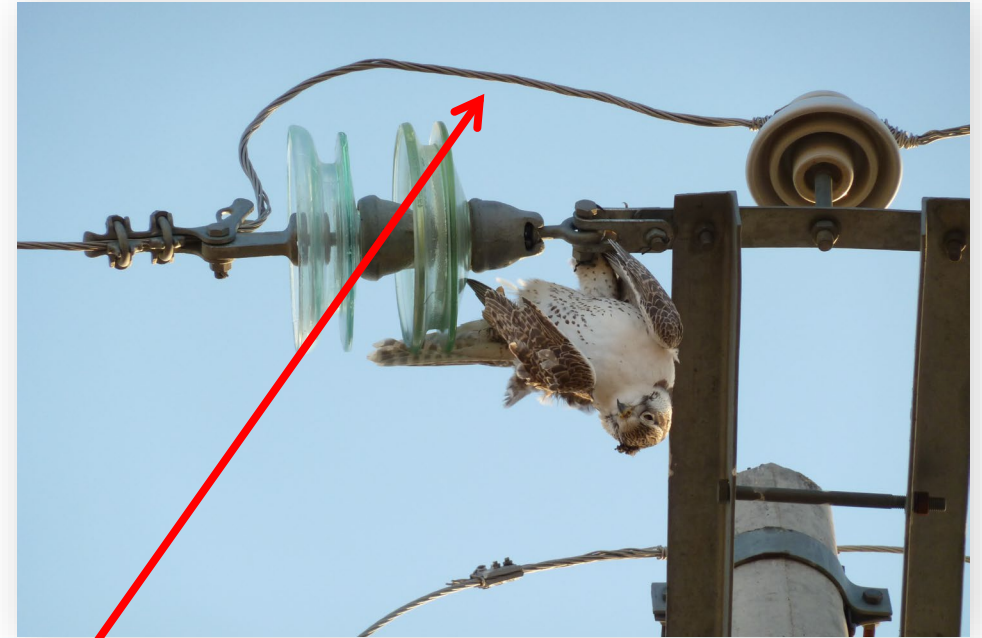
Fiberglass

# Key terminology – jumper wire

Safe



Fatal



Jumper wire

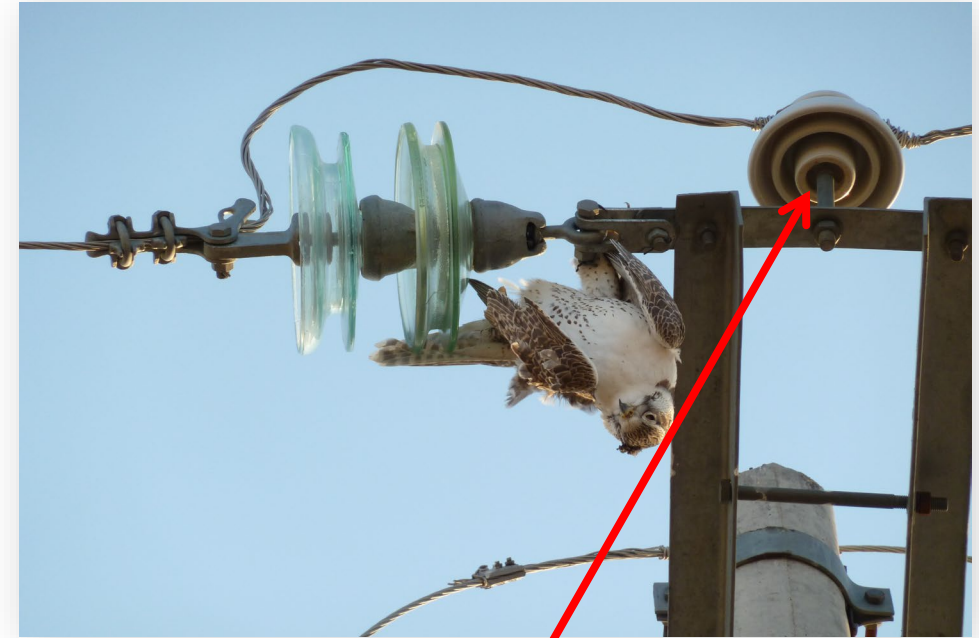
# Key terminology – insulator position

Safe



Insulator under crossarm

Fatal



Insulator over crossarm (pin insulator)

# Key terminology – special poles, more hazardous



Corner pole



Pole with transformer

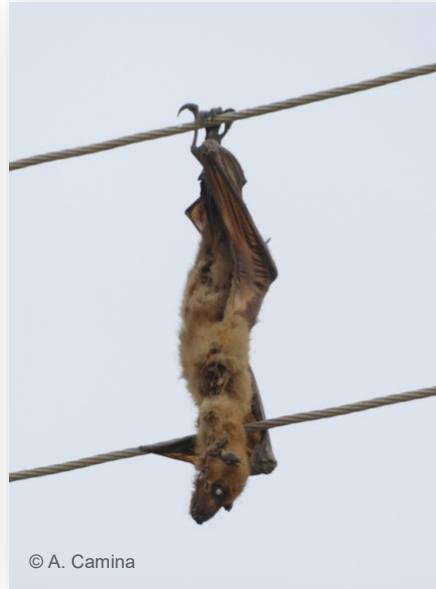
# Questions?

# Designing Safe Distribution Lines (New Infrastructure)



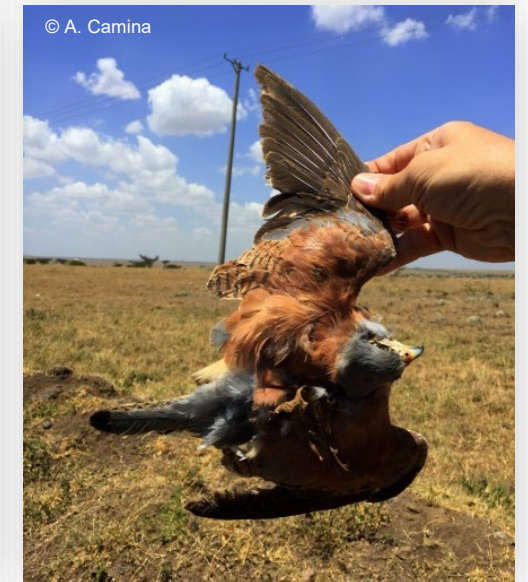
**Alvaro Camina Cardenal**, Biodiversity Specialist  
Global Support Team  
World Bank Group

# Designing Safe Distribution Lines (New Infrastructure)



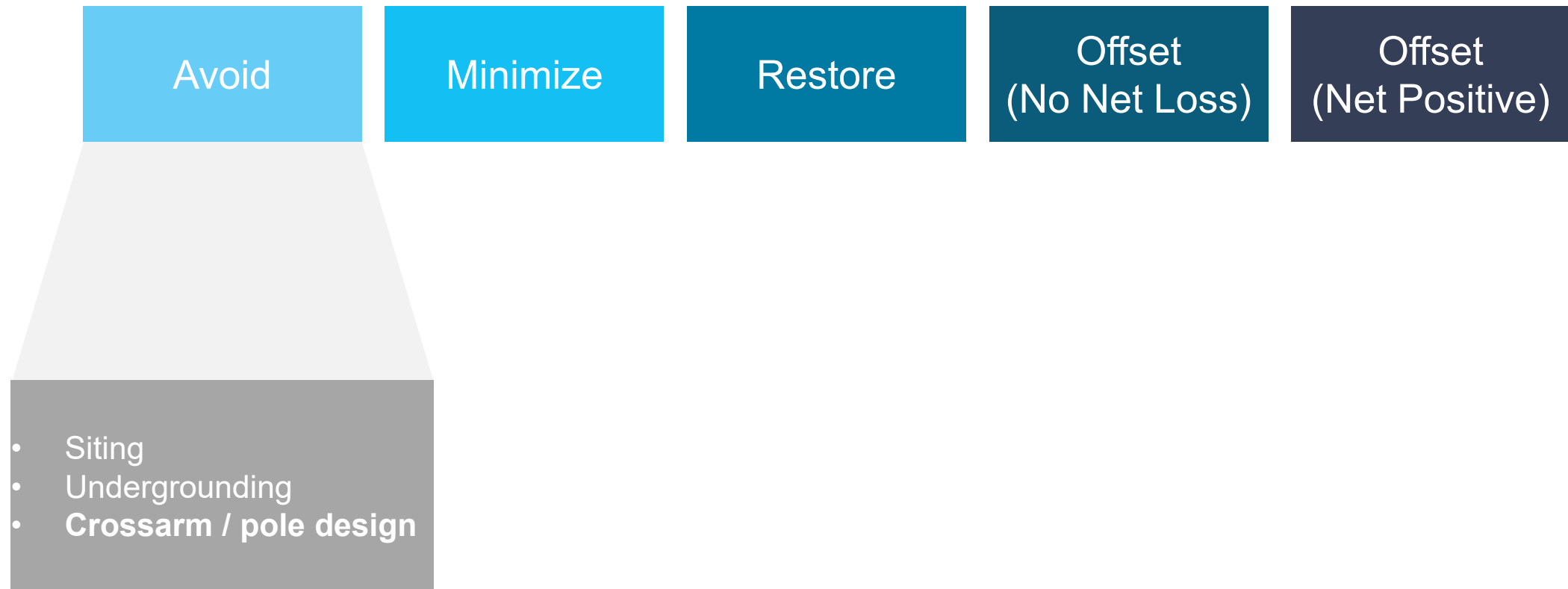
## Electrocution depends on:

- Type of species
- Environmental factors
- The crossarm / pole design



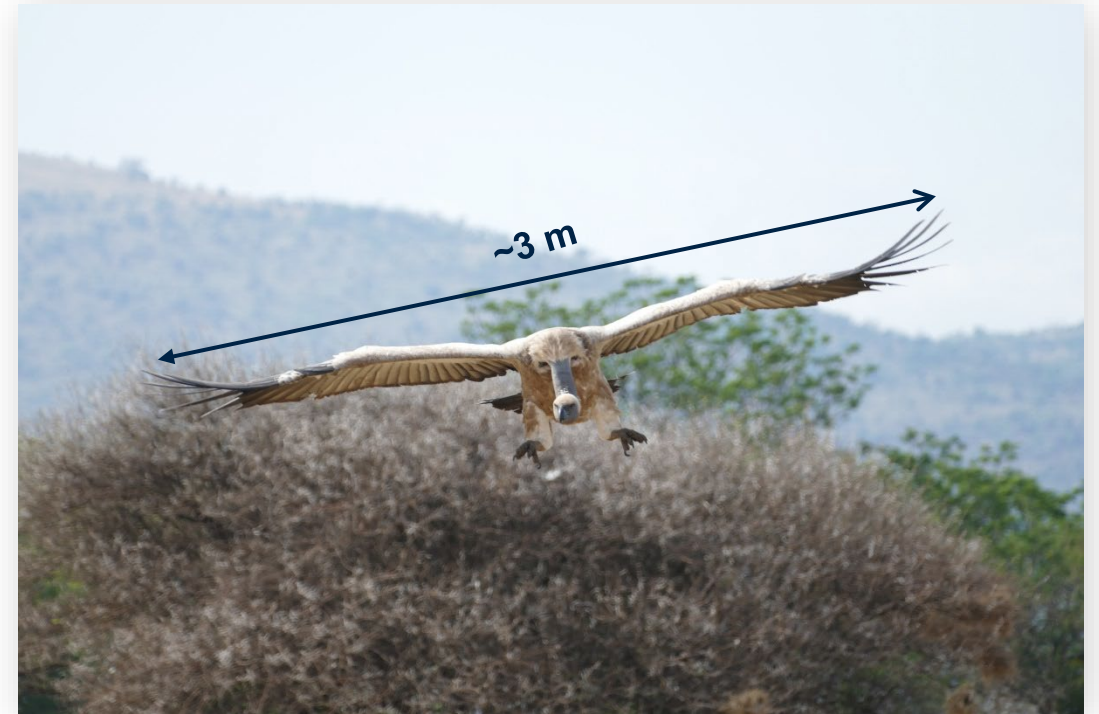
# Designing Safe Distribution Lines (New Infrastructure)

## Mitigation Hierarchy



# Core Design Principles

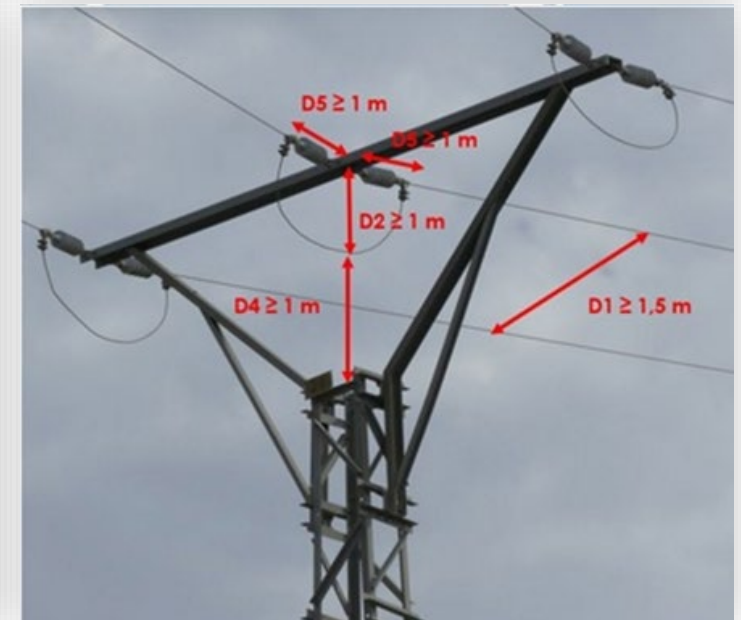
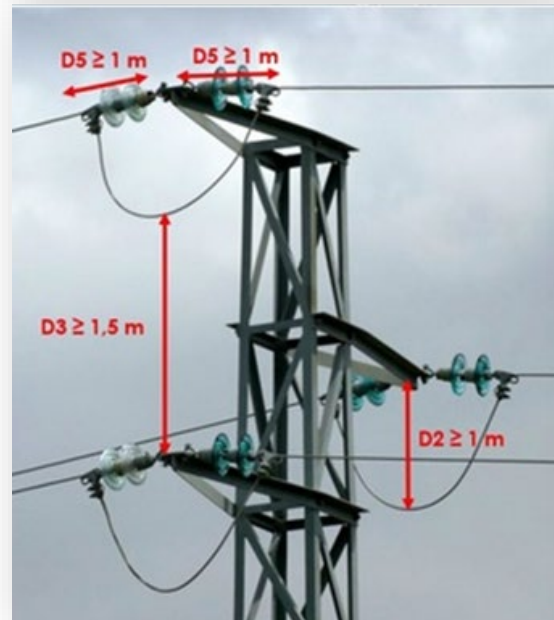
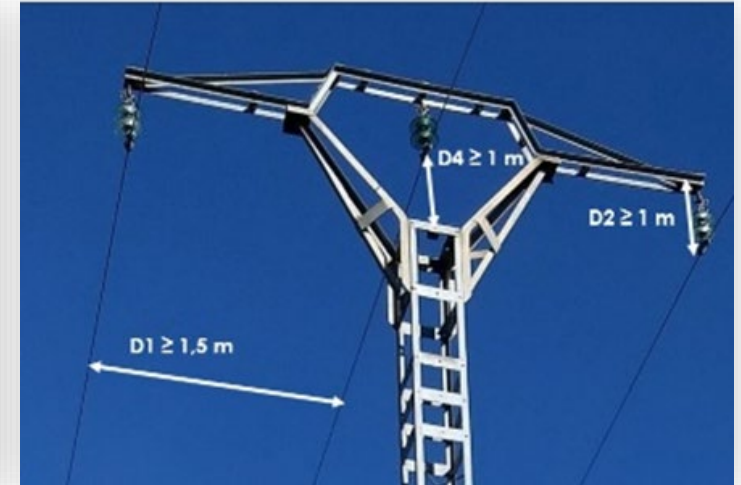
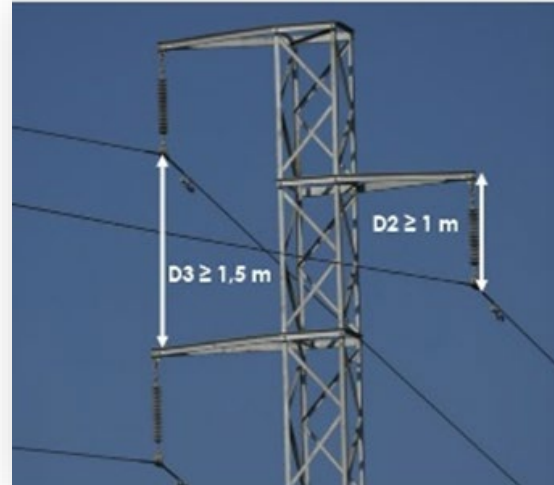
Safe distancing as the preferred permanent solution



Designing for the largest regularly occurring species

# Core design principles

Good designs +  
adequate  
measurements



# Electrocution risk

Insulator Configurations: pin / suspended



The advantages of suspended insulators

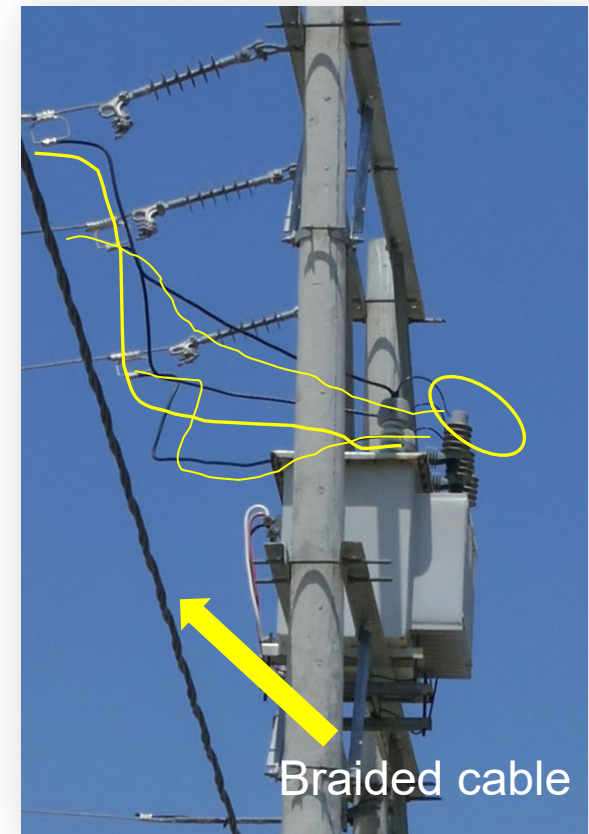
# Electrocution risk

Strain insulators & jumpers



# Electrocution risk

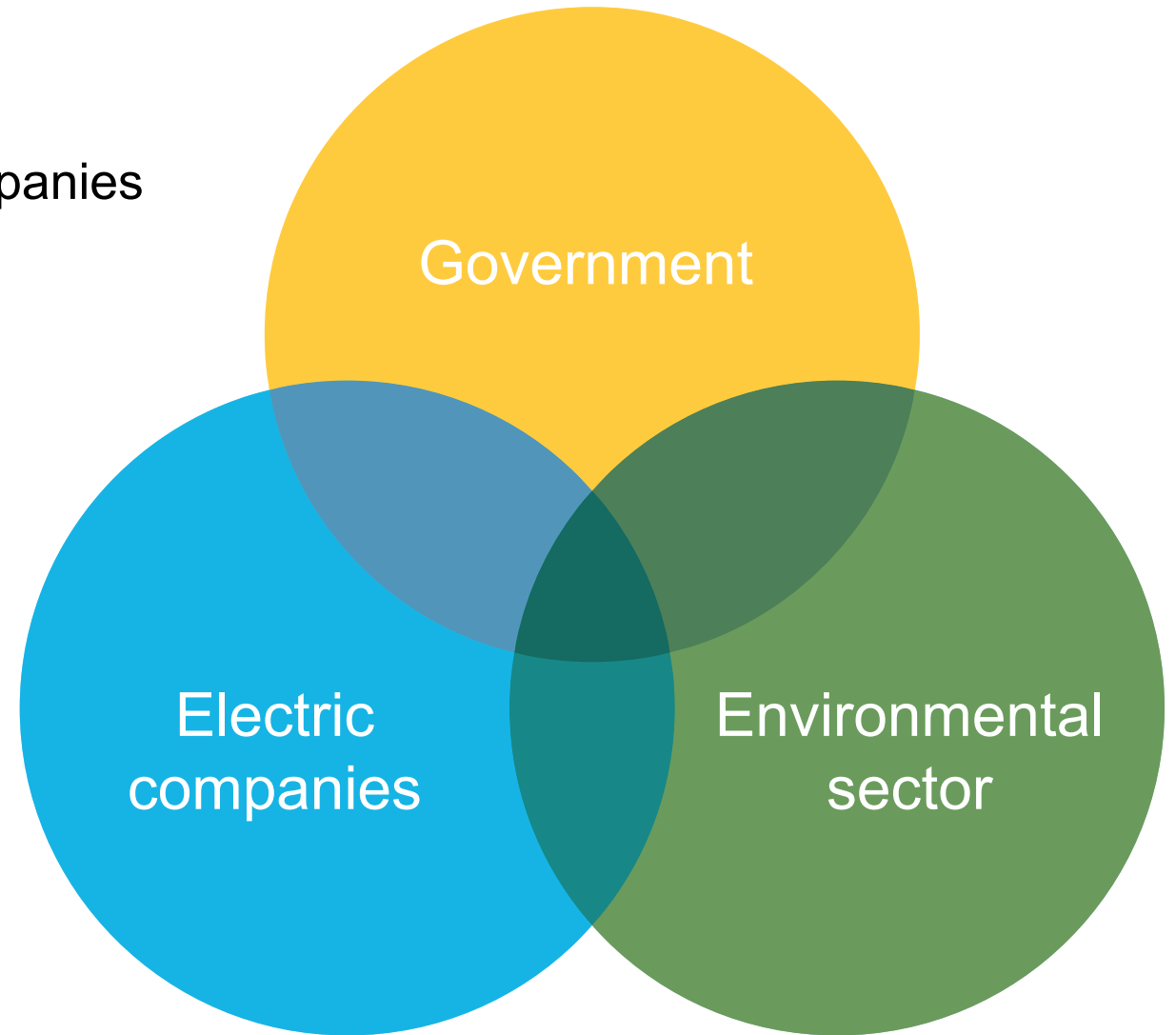
## Cross-sections & equipment Support Structures



# Prevention through design

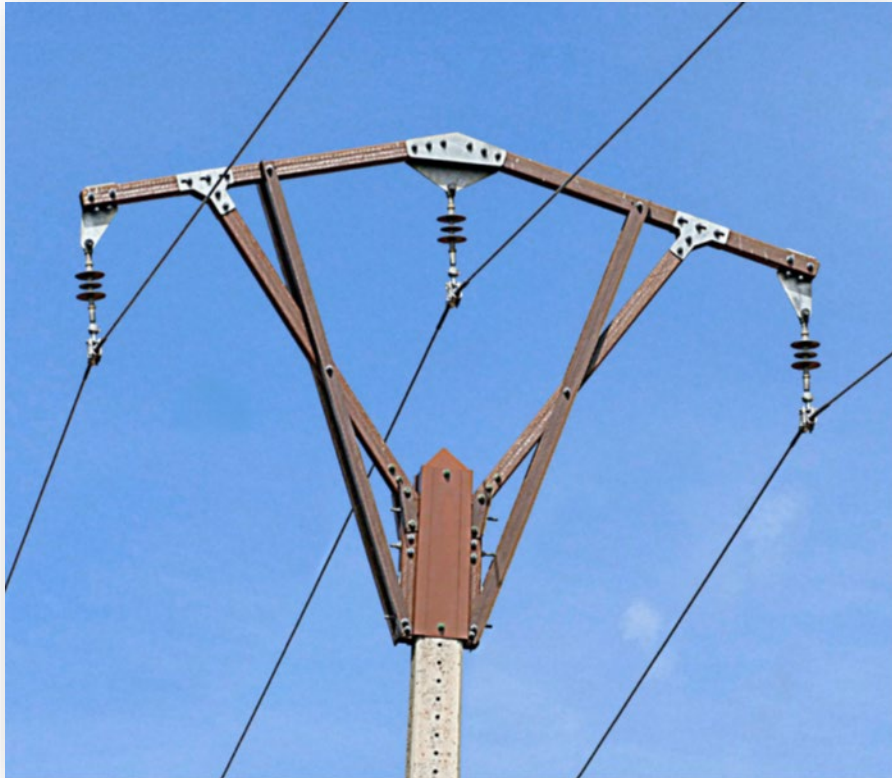
Cross sector efforts: Legislators, Electric companies and Environmental practitioners

- Nature protection (National regulations and International agreements like CMS)
- Electricity sector technical design requirements.
- Experiences from the field – what works and what doesn't



# Prevention through design

Cross sector efforts: Legislators, Electric companies and Environmental practitioners



Designed to  
be 100% safe

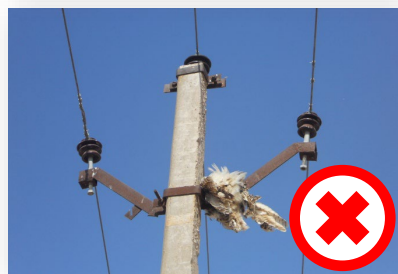
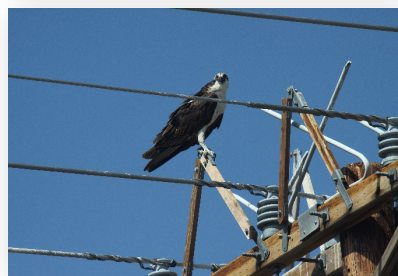
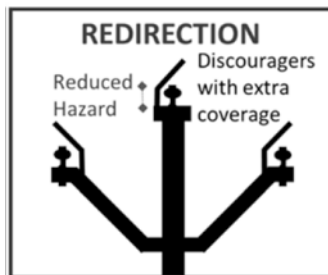
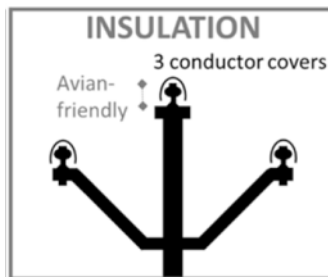
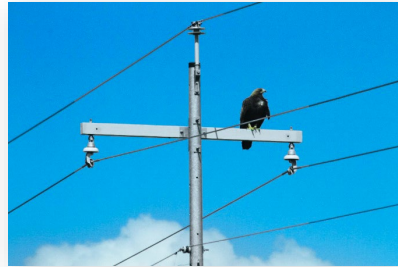
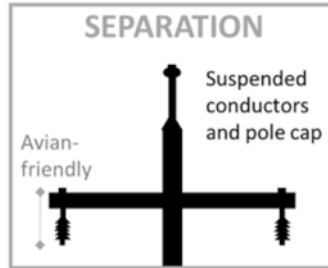


# Retrofitting Existing Lines: What Works and Where



**Rick Harness**, Certified Wildlife Biologist  
EDM International, Inc

# Retrofitting Versus Safe Design

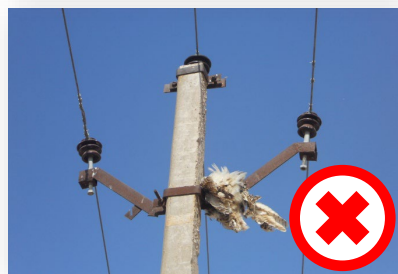
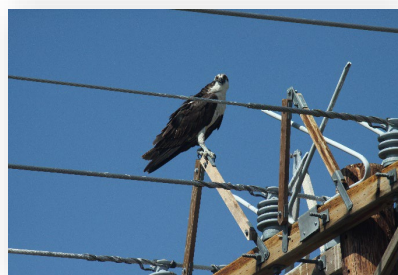
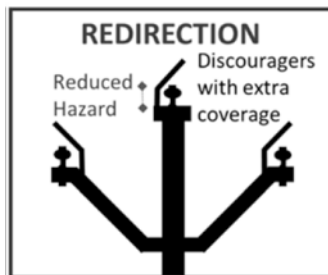
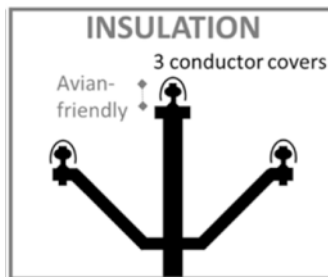
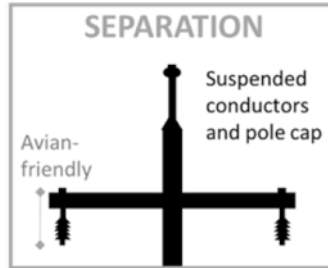


## Mitigation

When bird-safe design options have not been implemented on an existing operational network, electrocution risk can be reduced through retrofitting high risk poles using insulation.

Insulation is also required where safe distancing may not be feasible, as described above in the “Equipment Support Structures” section of the IFC Tip Sheet.

# Retrofitting Versus Safe Design



Raptor protection insulation refers to specialized covers and shields installed on overhead power lines and utility structures. Its primary purpose is to:

**Prevent Avian Electrocution:** Eliminate the ability of raptor to simultaneously touch two energized components or an energized component and a grounded part.

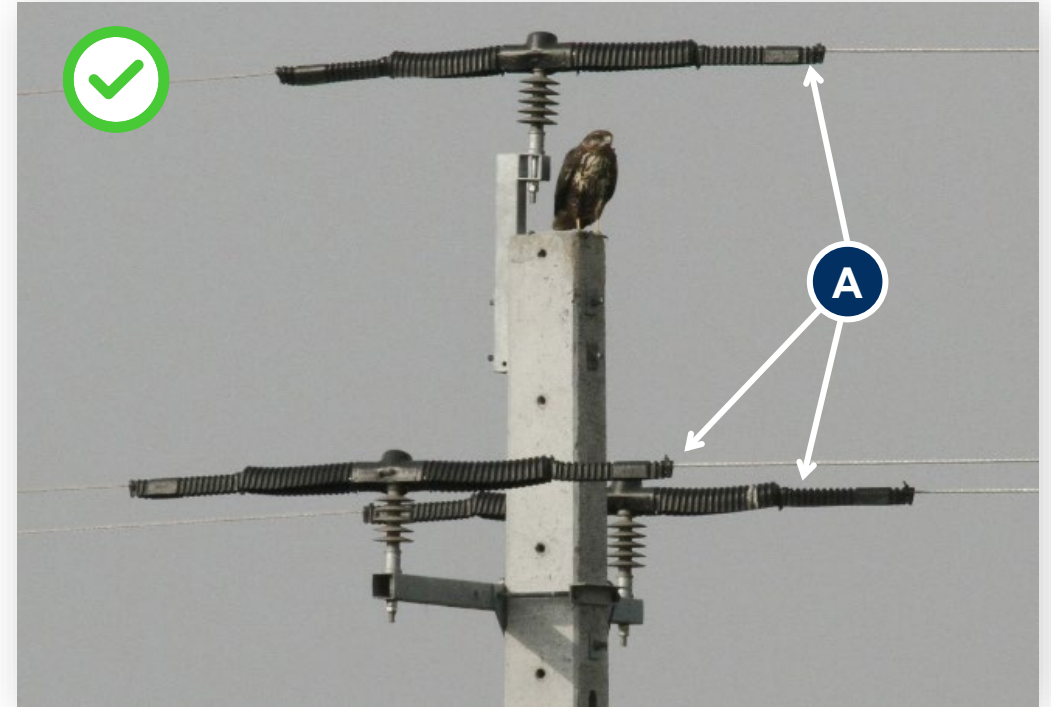
**Reduce Outages:** It minimizes animal-caused short circuits that lead to power interruptions and potential fires.

**Safety Note:** Raptor protection insulation is *not* designed to protect humans from electrical shock.

# Goal – Retrofit High Risk Structures



High Risk Structure

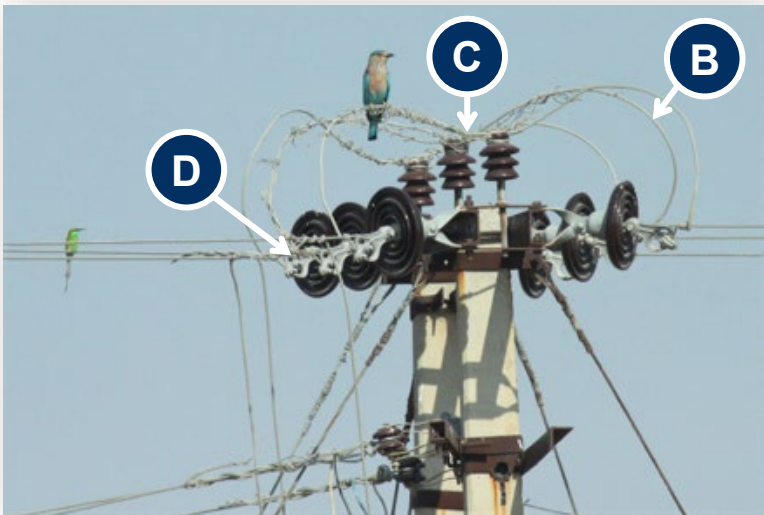
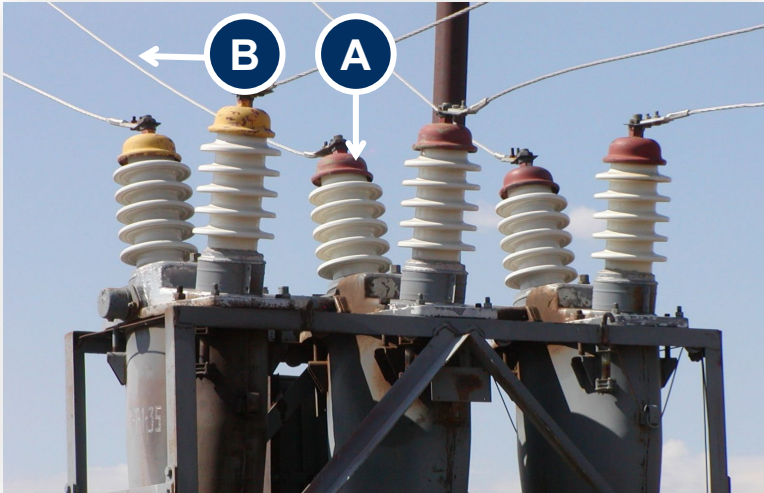


Avian Friendly Retrofitted Structure:

**A** Install 3 Conductor Guards


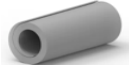

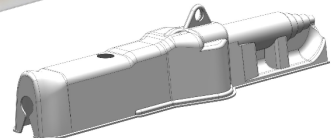
# Retrofitting

Uninsulated

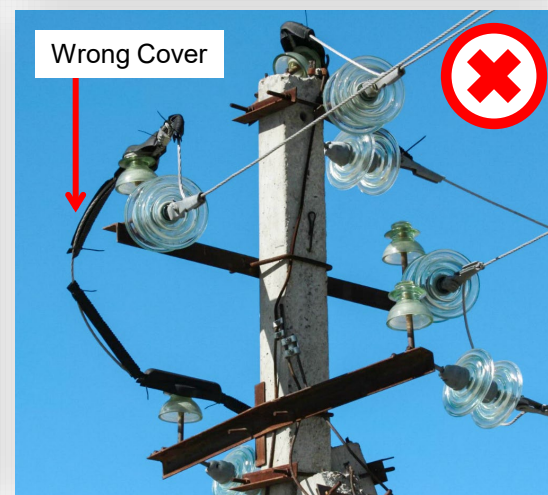
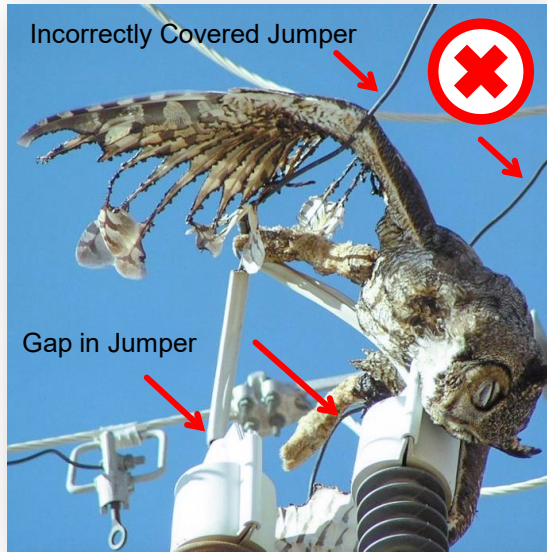


EPRI (2019): There are over 347 commercially available retrofitting products designed to mitigate animal-caused outages on overhead distribution and transmission lines, and in substations.

## Typical Retrofitting Products

- A** Bushing Covers (e.g., Transformers) 
- B** Jumper Wire Insulation (Flexible split insulation, to be installed over existing energized conductors). 
- C** Conductor Covers (Pin Insulators). 
- D** Deadend Covers (Strain Insulators). 

# The importance of **right** product selection and **proper** installation



## Desired properties:

### Proper Fitting:

- No Gaps
- Tight Fitting

Easy to Install (seek line technician input).

Superior Material Properties\* (seek engineering input):

- UV Resistant
- Heat/Cold Tolerant
- Tracking Resistant

\* Institute for Electrical and Electronics Engineers (IEEE) Standard 1656-2010: Testing the Electrical, Mechanical, and Durability Performance of Wildlife Protective Devices on Overhead Power Distribution Systems Rated up to 38kV (IEEE 1656TM)

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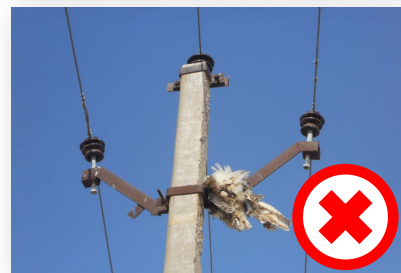
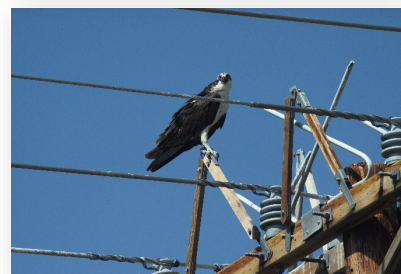
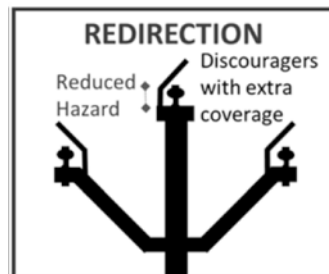
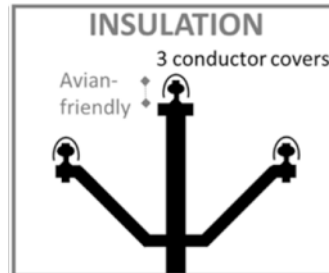
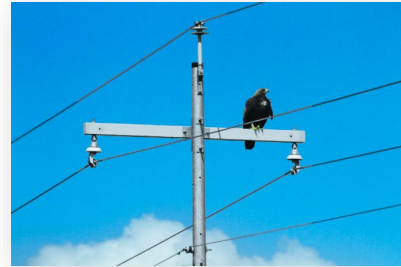
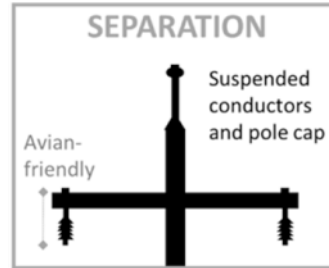
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# The importance of **right** product selection and **proper** installation

## Redirection and its HAZARDS



- Perch deterrents and perch guards create barriers that prevent birds from contacting energized components and ground components.
- Birds may defeat perching discouragers and the least preferred mitigation measure. To be effective they must be sized properly for the species of concern while proving proper electrical separation.
- Discouragers may also provide an inadvertent location for birds to place nests.



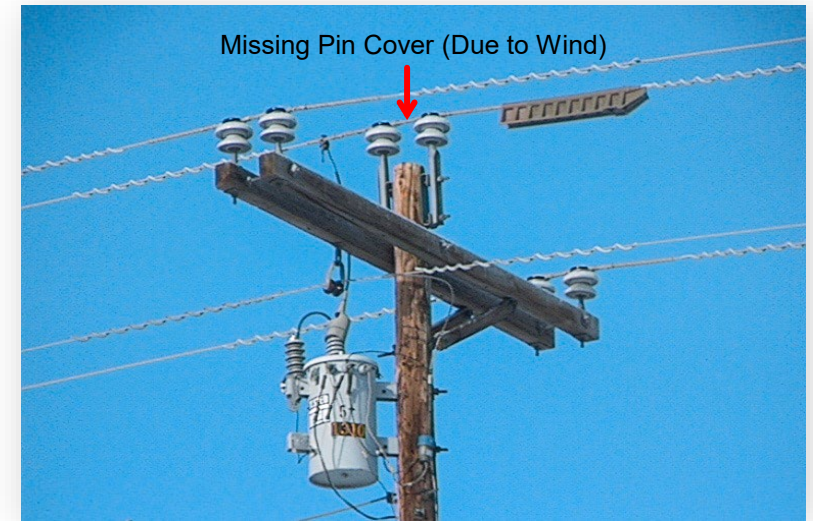
# The importance of maintenance

## Monitoring:

As part of a long-term routine maintenance program, insulating materials and devices should be monitored regularly and replaced when necessary to maintain effectiveness. Monitoring frequency depends on climatic conditions, the type of material used, and the stress that seasonal conditions place on the components.



Deteriorated Bushing Covers

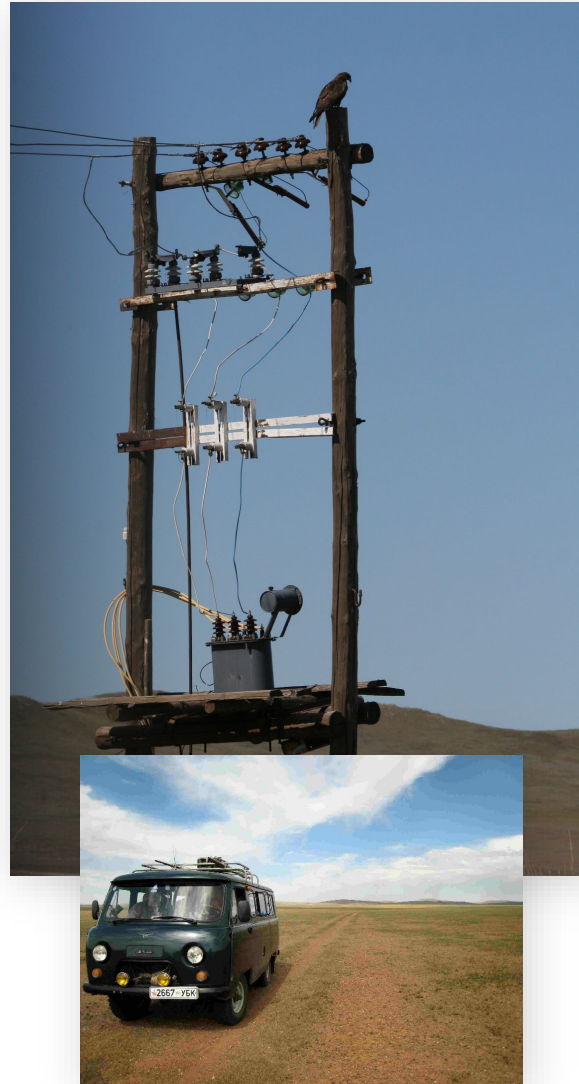


# Where to Retrofit?

Not worth it!



Focus here!



Retrofitting is costly!

High-risk poles in favorable habitat for the species of concern should be targeted for remediation.

Outage data may be a useful proxy.

High Risk Poles – Risk Increases with Increasing Number of:

- Phases
- Exposed Jumpers/Equipment
- Grounds

# Retrofitting conclusions

- Insulation is required ***where safe distancing may not be feasible.***
- Perform a Risk Assessment to identify high-risk segments for retrofitting.
- Use high-quality insulation materials (Refer to IEEE guidelines).
- Products must be installed correctly and monitored for regular long-term maintenance.
- Apply redirection measures with caution. These measure can increase risk or be ineffective and thus incur financial costs without achieving the desired outcome.



# Questions?

# Closing Remarks

## Umberto Gallo-Orsi

Programme Management Officer  
Memorandum of Understanding on the  
Conservation of Migratory Birds of Prey in Africa  
and Eurasia (Raptors MOU)



Photo credit: Rick Harness

## Robert Adamczyk

Senior ESG Adviser  
Head of Energy Team, Environment and  
Sustainability Department  
EBRD

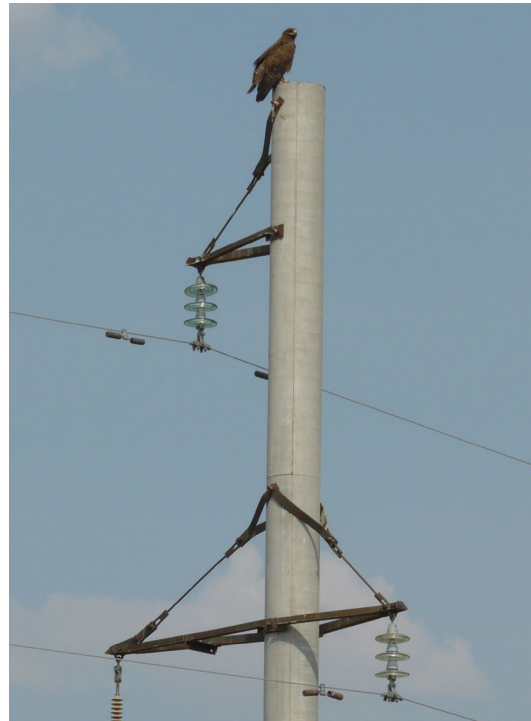


Photo credit: Rick Harness



Photo credit: Rick Harness

Thank you